Claims

[c1] WE CLAIM:

1. A plurality of drill pipes, each drill pipe comprising;
a first inductive coupler comprising an Archimedean coil inserted in a non-electrically conductive core, detachably assembled within a first groove in a first end of the drill pipe, and a second inductive coupler comprising a second Archimedean coil inserted in a second non-electrically conductive core, detachably assembled within a second groove in a second end of the drill pipe, the first and second inductive couplers in electrical communication;
wherein the first inductive coupler at the first end of one of the plurality of drill pipes is cooperatively arranged to be in magnetic, but not in electrical communication with the second inductive coupler at the second end of another of the plurality of drill pipes.

[c2] 2.The plurality of drill pipes of claim 1 wherein the first and second Archimedean coils each produce an electromagnetic field, and wherein each coil comprises at least a single turn or loop of electrically conductive material.

[c3] 3.The plurality of drill pipes of claim 2 wherein each

Archimedean coil further comprises of a core for reducing eddy currents in the drill pipes and for focusing the electromagnetic field toward the electromagnetic field of the adjacent coupler.

[c4] 4.The plurality of drill pipes of claim 3 wherein the core comprises a material selected from the group consisting of ferrous metals, iron, powdered irons, ferrites, ceramics, and combinations thereof.

[c5] 5.The plurality of drill pipes of claim 3 wherein the core further comprises a laminated or tape wound core.

[c6] 6.The plurality of drill pipes of claim 2 wherein the electromagnetic field is produced by annular traces printed onto a circuit board.

[c7] 7.The plurality of drill pipes of claim 1 wherein at least one of the Archimedean coils comprises a planar or radial Archimedean coil.

[c8] 8.The plurality of drill pipes of claim 1 wherein at least one of the Archimedean coils is an axially wound coil.

[c9] 9.The plurality of drill pipes of claim 1 wherein electrical communication is accomplished by an insulated wire or a coaxial cable.

[c10] 10.The plurality of drill pipes of claim 1 wherein the in-

ductive couplers are powered by a remote low wattage power source of less than 1.0 watts and more than .001 watts.

[c11] 11.The plurality of drill pipes of claim 1 wherein the inductive couplers operate with a high frequency carrier signal of between 1 megahertz and 10 megahertz.

[c12] 12.The plurality of drill pipes of claim 1 wherein when the inductive couplers are made up with the drill pipes such that upon assembly the inductive couplers are within 1.0 inches of each other.

[c13] 13.The plurality of drill pipes of claim 12 wherein the inductive couplers contact one another.

[c14] 14.The plurality of drill pipes of claim 1 wherein the inductive couplers are sealed from contamination.

[c15] 15.The plurality of drill pipes of claim 1 wherein the inductive couplers are capable of transmitting and receiving a carrier signal across three or more of the plurality of drill pipes without a boost from of an additional power source or repeater.

[c16] 16.The plurality of drill pipes of claim 10 wherein the low wattage power source comprises batteries or a downhole generator.

[c17] 17. A plurality of remotely powered inductive couplers for use across a plurality of joints, each joint comprising; a tube with first and second ends, a first one of the plurality of inductive couplers comprising a first Archimedean coil inserted in a non-electrically conductive core and detachably assembled within a first groove in the first end of the tube, and a second one of the plurality of inductive couplers inductive couplers comprising a second Archimedean coil inserted in a second non-electrically conductive core and detachably assembled within a second groove in the second end of the tube, the first and second ones of the plurality of inductive couplers in electrical communication;
wherein the first one of the plurality of inductive couplers at the first end of one of said joints is cooperatively arranged to be in magnetic, but not in electrical communication with the second one of the plurality of inductive couplers at the
second end of another of said joints.

[c18] 18.The plurality of remotely powered inductive couplers of claim 17 wherein the first and second Archimedean coils each produce an electromagnetic field, and wherein the coil comprises at least a single turn or loop of electrically conductive material.

[c19] 19.The plurality of remotely powered inductive couplers of claim 18 wherein each Archimedean coil further comprises of a core for reducing eddy currents in the drill pipes and for focusing the electromagnetic field toward the electromagnetic field of the adjacent coupler.

[c20] 20.The plurality of remotely powered inductive couplers of claim 19 wherein the core comprises a material selected from the group consisting of ferrous metals, iron, powdered irons, ferrites, ceramics, and combinations thereof.

[c21] 21.The plurality of remotely powered inductive couplers of claim 19 wherein the core further comprises a laminated or tape wound core.

[c22] 22.The plurality of remotely powered inductive couplers of claim 18 wherein the electromagnetic field is produced by annular traces printed onto a circuit board.

[c23] 23.The plurality of remotely powered inductive couplers of claim 17 wherein at least one of the Archimedean coils comprises a planar or radial Archimedean coil.

[c24] 24.The plurality of remotely powered inductive couplers of claim 17 wherein at least one of the Archimedean coils is an axially wound coil.

[c25] 25.The plurality of remotely powered inductive couplers of claim 17 wherein electrical communication is accomplished by an insulated wire or a coaxial cable.

[c26] 26.The plurality of remotely powered inductive couplers of claim 17 wherein the inductive couplers are powered by a remote low wattage power source of less than 1.0 watts and more than .001 watts.

[c27] 27.The plurality of remotely powered inductive couplers of claim 17 wherein the inductive couplers operate with a high frequency carrier signal of between 1 megahertz and 10 megahertz.

[c28] 28.The plurality of remotely powered inductive couplers of claim 17 wherein when the inductive couplers are made up with the drill pipes such that upon assembly the inductive couplers are within 1.0 inches of each other.

[c29] 29.The plurality of remotely powered inductive couplers of claim 18 wherein the inductive couplers contact one another.

[c30] 30.The plurality of remotely powered inductive couplers of claim 17 wherein the inductive couplers are sealed from contamination.

[c31] 31.The plurality of remotely powered inductive couplers of claim 17 wherein the inductive couplers are capable of transmitting and receiving a carrier signal across three or more joints of the plurality of joints without a boost from of an additional power source or repeater.

[c32] 32.The plurality of remotely powered inductive couplers of claim 26 wherein the low wattage power source comprises batteries or a downhole generator.